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FOOD SECURITY OF RICE-FARMING HOUSEHOLDS IN THAILAND: A LOGIT ANALYSIS

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ABSTRACT

Many households in underdeveloped and developing countries still suffer from food insecurity, which is unreliable access to a sufficient quantity of nutritious food. It is a major cause of malnutrition and undernourishment. Thailand is a food surplus country but food accessibility, particularly among rice-farming households, is often problematical. Consequently, their energy consumption is often lower than national minimum dietary energy requirements and they suffer from undernourishment. To provide policy recommendations to support rice-farming households, this study identifies the determinants of their food security using a logit model. Household food security is a binary variable: it is classified as food-secure or food-insecure using a minimum dietary energy requirement threshold of 2,100 kcal/adult equivalent/day. The analysis draws on 2,871 households from Thailand's Socio-Economic Survey (SES) data in 2011. It finds that 57% of total households are food-secure, while 43% are food-insecure. Key findings are as follows. First, those households with relatively better educated heads are more likely to be food-secure than those with lower educational levels. Second, increases in household income or food expenditure lead to higher probabilities of food security. Third, households that produce more food for own consumption are more likely to be food-secure than those which sell a higher proportion of what they produce. Fourth, livestock ownership or increases in farm inputs, such as family labor, farm size and fertilizer, improve the probability of food security. However, increases in household size, the dependency ratio, and total household expenditure result in a lower probability of households being food security. The findings therefore suggest that food insecurity can be alleviated by the extension of provisions towards integrated farming and self-sufficiency, better family planning programs and child care, better education, and managing household income and expenditure for food consumption. In addition, increases in farm size, use of family labor and use of fertilizer can further enhance food security.

JEL Classifications: C21, O12, and Q18
Keywords: food security, rice-farming households, Thailand, logit model.
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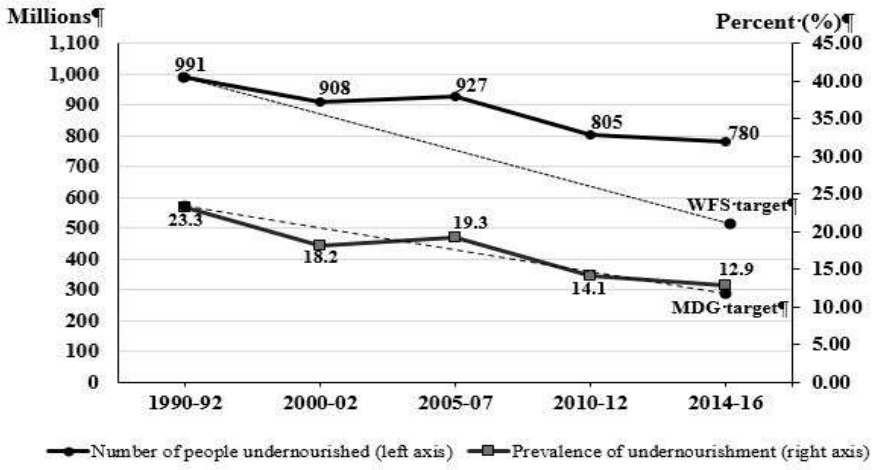
INTRODUCTION

Globally, around 800 million people cannot meet their basic nutritional needs (FAO, IFAD, WFP 2015). Food security is access to a sufficient quantity and quality of food and it is influenced by population growth, poverty, political and economic crises, and natural disasters. Despite increasing food supplies, constraints on food accessibility and insufficient household income lead to hunger, poverty and food insecurity. Improving food security to reduce global hunger and poverty is an important component of economic development and is one of the most challenging issues for policy makers.

The World Food Summit (WFS) in 1996 defines food security as "…a situation that exists when all people, at all times, have physical, and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO 1996). WFS set a target of hunger reduction and this was reinforced in 2000 when the Millennium Development Goals (MDGs) of the UN Development Programme included a target of reducing by half the proportion of people in developing countries who suffer from hunger by 2015 (FAO, IFAD, WFP 2015). This target is universally recognized and is monitored by FAO using 1990-92 as the benchmark. In Figure 1, the MDGs' target (the reduction in the proportion of undernourished) was almost reached in 2014-16, but the number of undernourished is well above the WFS's target because of population growth. The World Food Programme (WFP 2015) also supports these targets in its Zero Hunger Programme which aimed to reduce the number of hungry people to 5% by 2015. Notwithstanding these initiatives, many developing countries, including Thailand, still suffer from undernourishment and in 2015 the UN reframed its MDGs into a new set of Sustainable Development Goals which aim to eradicate hunger by 2030 (UN 2015).

FIGURE 1 UNDERNOURISHMENT IN DEVELOPING REGIONS



Source: FAO, IFAD, WFP (2015)

Thailand is a food surplus country but food accessibility is problematic among the poor (Wangthamrong 2010; NSO and OAE 2012). Many rice-farming households are smallholders with an average land holding of around 22 rais (3.5 hectares) (OAE 2012). The average household annual income of agricultural workers and rice farmers in 2010 was 196,000 Baht (US$5,700) or 49,800 Baht (US$1,400) per individual, which is a half that of self-employed, non-farm workers and three times lower than that of blue collar workers (NSO 2012). On average, 35% of Thai household expenditure is spent on food (NSO 2012), with 60% of dietary energy consumption (DEC) acquired from purchases (NSO and OAE 2012). Average DEC of low-income households, including rice-farming households, is 1,760 kcal/person/day, which is lower than the average national minimum dietary energy

requirement of 1,882 kcal. If households have insufficient income, they suffer from inadequate food access and malnutrition and they may not be able to provide sufficient food for all members to lead a productive and healthy life. This compromises national food security.

Many rice-farming households in Thailand consume fewer calories than their minimum dietary energy requirements and some are food-insecure. With limited resources for policy implementation, it is difficult for the Thai government to respond effectively to the needs of food-insecure households. This study examines the determinants of food security in Thai rice-farming households using a logit model. Hypothesized determinants include household characteristics, farm production, and current policy instruments. The study is novel in that it uses a large cross-sectional household survey. Our results provide an understanding both of food security and of policy guidance in developing countries. The paper is organised as follows: Section 2 discusses some relevant literature; Section 3 discusses data and data analysis; Sections 4 provides results; and Section 5 concludes.

A REVIEW OF DETERMINANTS OF HOUSEHOLD FOOD SECURITY

Table 1 summarizes the results of some recent studies in developing countries that explore determinants of household food security. Most calculate food security status as the difference between calorie intake and requirements. These models identify a range of factors that have a positive influence on food security and include household level characteristics like income or the availability of family labor, ownership of particular assets such as land or livestock, and other factors such as access to credit or membership of particular groups or networks. Conversely, some factors decrease the likelihood of food security including household size and the dependency ratio.

In Thailand, Piaseu (2005) investigates the impact of socio-economic factors and living conditions on household food insecurity among the poor in Bangkok using multiple regressions and cross-sectional survey data from 199 female food providers. Results show that increases in household income and participation in social networks reduce food insecurity, while a rise in the number of children increases the risk of food insecurity. Wangthamrong (2010) examines factors affecting the probability of households being in food-poverty using a probit model and cross-sectional data from the same SES as used here albeit for 2006. Almost 12,000 farm households are classified into two groups using the national food poverty threshold of 779 Baht (US$22.58)/person/month. Results show that household size, the education of household heads, their gender, and household income significantly reduce food poverty, but the government's health care coverage program does not significantly reduce food poverty. Bumrungkit (2014) examines household determinants of, and vulnerability to, food insecurity using the SES for 2010. Over 33,000 households are classified into food-secure/insecure using the minimum dietary requirement of 1,874 kcal/adult equivalent/day following OECD. By contrast to other studies where food secure/insecure are approximately divided equally, Bumrungkit finds that 95% of households are food-secure and 5% are food-insecure. A probit model reveals that the significant factors of food insecurity include household size, the household head's age, the amount of home-produced food, farm size, income from the farm, access to credit, occupation, health issues, and the dependency ratio.

TABLE 1 SUMMARY OF EMPIRICAL OF EMPIRICAL STUDIES OF HOUSEHOLD FOOD SECURITY

Authors	Study area	Method	Significant determinants of food security	
			Positive	Negative
Haile et al. (2005)	Ethiopia	Logit	Fertilizer use, farm land, ox ownership, *per capita* production.	Household size.
Piaseu (2005)	Thailand	OLS	Income, social networks	Number of children.
Amaza et al. (2006)	Nigeria	Logit	Education, farm size, extension, member of co-operative societies, household asset values, production-consumption ratio.	Extend of output commercial sector, expenditure on education.
Babatunde et al. (2007)	Nigeria	Logit	Income, food quality from own production, education.	Household size, age of household head.
Sidhu et al. (2008)	India	Logit	Income, household type.	Family size.
Wangthamrong (2010)	Thailand	Probit	Income earning members, income, household asset values, education, urban area.	Household size, male household head, age of household head, agricultural land.
Beyene and Muche (2010)	Ethiopia	Logit	Chemical fertilizer use, non-farm income, cultivated land, owning livestock, number of oxen.	Household size, education.
Maharjan and Joshi (2011)	Nepal	Logit	Male-headed household, landholding, participation in community organizations, irrigation.	Family size, occupational caste, dependency ratio.
Bashair et al. (2012)	Pakistan	Logit	Income, livestock assets, education.	Household size, household type, age of household head
Aidoo et al. (2013)	Ghana	Logit	Farm size, off-farm activities, credit access.	Marital status, household size.
Zakari et al. (2014)	Niger	Logit	Gender, family labor, distance from main road.	Diseases and insects, floods, lack of money, market access, food aid.
Bumrungkit (2014)	Thailand	Probit	Farm size, own landholding, home-produced food, farm income, access to credit, occupation.	Household size, dependency ratio, land renting, health.

In summary, a household can be classified as either food secure or food insecure. Food security is therefore a binary variable and a logit model is widely used to examine its determinants. The factors that influence food security can be grouped into three main categories: first, demographic characteristics such as household size, gender, and the

education of the household head; second, farm production such as in farm size and fertilizer use; and third, policy instruments such as access to credit, and extension.

THE DATA AND DATA ANALYSIS

The cross-sectional data used in this study are from Thailand's SES* which was undertaken between January and December, 2011 (NSO 2012). It is based on a stratified two-stage sampling design. Data on 42,083 households were collected to be representative of the whole country, and 2,781 are rice-farming households (with 8,993 family members) and they can work both on and/or off the farm. In the SES, data on different types of food items consumed are collected as a seven-day recall diary. There are 193 food items in the survey and in this study each is converted into calorie intake using the nutritive value of Thai foods, from the Ministry of Public Health (MOP), and the ASEAN Food Composition Tables, from the Institute of Nutrition, Mahidol University, Thailand. To account for differences in calorie intake among household members, calories available/adult equivalent/day are calculated for each household by taking into account age and gender based on adult male equivalents (Smith and Subandoro 2007). For each child younger than one year, an extra 500 calories are added to address the greater needs of breastfeeding mothers (FAO, WHO, UNU 1985).

The minimum average daily energy requirement in developing countries is 2,100 kcal/day (Gibson 2012), which is also equal to that for an average male aged 31-50 undertaking manual labor as estimated by Thailand's MOP. Food security status is then estimated by calculating the difference between calories available and energy requirements. Using this threshold, rice-faming households are categorized as being either food-secure or food-insecure. Of the 2,781 rice-farming households in the SES, 1,585 (57%) are food-secure and 1,196 (43%) are food-insecure. Summary data statistics are presented in Table 2. The average calorie consumption of food-secure households is 3,000 kcal/day which is twice that of food-insecure households. The average household monthly income of food-secure households is higher than that of food-insecure households by 6%. The average size of food-secure households (2.75) is lower than that of food-insecure households (3.68), while the average ages of household heads in both groups are the same at 55 years. Eighty percent (76%) of food-insecure (food secure) households are headed by a male. As expected, education is higher for food-secure household heads. The average number of family workers in food-secure households (2.52) is higher than that in food-insecure households (2.08), and the dependency ratio of food-secure households is lower (0.09) than that of food-insecure households (0.77).

TABLE 2 SUMMARY STATISTICS OF RICE-FARMING HOUSEHOLDS

Household characteristics	**Food-secure**	**Food-insecure**
Food security status (%)	56.99	43.01
Calorie consumption (kcal/day)	3,003	1,469
Household income (Baht)	14,087	13,231
Household size (No.)	2.75	3.68
Male-headed household (%)	76.21	79.85
Age of household head (years)	54.45	54.53
Dependency ratio	0.09	0.77
Education of household head		
- Illiterate (%)	1.39	4.52
- Primary or below (%)	85.17	86.20
- Secondary or equivalent (%)	10.47	8.03
- Degree (%)	2.97	1.25
Household expenditure (Baht)	11,880	11,338
Household food expenditure (Baht)	5,359 (45.11%)	4,581 (40.40%)
Consumption expenditure and other household expenditure (Baht)	6,521 (56.89%)	6,657 (58.71%)
Household production (Baht)	123,371	110,144
- for sale	93,219 (75.56%)	90,053 (81.76%)
- for household consumption	19,345 (15.68%)	12,633 (11.47%)
Livestock ownership (%)	20.04	16.48
Farm size (Rai)	13.66	13.62
Fertilizer use (Baht)	53,531	45,723
Family labor (No.)	2.52	2.08
Universal Health Coverage Card (%)	93%	95%
Access to government credit (%)	90%	89%

Source: SES (2011).

Following the literature and data availability, household food security is a binary variable (secure/insecure) and a logit model is applied as follows:

$$\text{Logit}\,(P_i) = \ln\left[\frac{P_i}{1-P_i}\right] = d_0 + d_1 X_{1i} + \ldots + d_K X_{Ki} + \varepsilon_i. \qquad (1)$$

where P is the probability of i^{th} household being food-secure, i = 1,…, n,
X_k are explanatory variables, k = 1,…, K,
d_k are estimated coefficients, and
ε_i is an error term.

We hypothesize that the explanatory variables, X_k in (1) are household characteristics, farm production, and policy instruments. Their definitions and expected impacts on food security are as follows.

Household characteristics

- Household size (HSIZE) (−) is the total number of household members. It is hypothesized to have a negative impact on food security because an increase in household size implies more people to be fed from limited sources (Aidoo et al. 2013).
- Gender of household heads (GEND) (+) is a dummy where GEND=1 for male and =0 for female. Male-headed households are expected to be more food-secure because female-headed households are usually characterized by lack of knowledge about the farm technology and lack of human capital (Maharjan and Joshi 2011).
- Age of household heads (AGE) (+) is assumed to have a positive effect on household food security because as age increases, farmers can acquire more knowledge and experience to become more food-secure (Beyene and Muche 2010).
- Dependency ratio (DR) (−) is the ratio of dependents to workers. It is hypothesized to have a negative effect on food security since an increase in dependents leads to an increase in consumption rather than production (Babatunde et al. 2007).
- Education of household heads (EDU) (+) is a set of three dummies: one for primary education which =1 for primary and =0 otherwise; one for secondary education which =1 for secondary and =0 otherwise; and one for degree education which =1 for degree and =0 otherwise. Educated households are hypothesized to have a better opportunity of managing their farms by adopting improved practices, contributing to an increase in production (Maharjan and Joshi 2011). Thus, education and household food security are positively associated.
- Household income (INCOME) (Baht) (+) is household income per month which includes farm, non-farm income and pensions. It is expected to have a positive relationship with food security because it can increase the probability of food accessibility, and it is also expected to enhance household's food production (Babatunde et al. 2007).
- Household expenditure (HEXP) (Baht) (−) is total household expenditure on food and non-food. If the proportion of expenditure spent on non-food is higher than spending on food, this lowers the probability of access to food. Thus, it is expected to have a negative relationship with food security.
- Food expenditure (FOODEXP) (Baht) (+). Households which spend money on food are more likely to be food-secure because they increase the probability of food accessibility for their members.

Farm production

- Revenue from rice sales (SALE) (Baht) (−). If households produce more rice for sale, the quantity of rice for feeding family members may falls. Thus, it is

expected that the households which produce for sale are more likely to be food-insecure.

- Household consumption (HCONS) (Baht) (+) is the value of output that is produced for own consumption. A household which produces for own consumption can secure the quantity of food requirement to feed its members. Therefore, food security and the value of own consumption are positively related.
- Livestock ownership (LIVE) (+) is a dummy where LIVE=1 if livestock is owned and =0 otherwise. Owned-livestock households are expected to be less vulnerable to food security because livestock is the prominent form of wealth and they supply manure to improve soil fertility (Beyene and Muche 2010).
- Farm size (LAND) (Rai) (+) is the size of cultivated land measured in Rai (1 Rai=0.16 Hectare). Farm households with large cultivated land sizes are more likely to be food-secure.
- Fertilizer application (FERT) (+) is a dummy where FERT=1 if applied and =0 otherwise. Fertilizer use can improve productivity per Rai and increase food production capacity (Beyene and Muche 2010). Thus, households using fertilizer are expected to be more food-secure than non-users.
- Number of family workers (LABOR) (+). An increase in the number of family workers increases worker capacity and reduces production costs from hiring labor. Thus, it is hypothesized to have a positive relationship with food security.

Policy instruments

- Ownership of a Universal Health Coverage Card (30 Baht) (UHC) (+) is a dummy where UHC=1 if the household receives this service and =0 otherwise. It can ensure equitable health care access and is hypothesized to be positively related with food security.
- Government credit access (CREDIT) (+) is credit access for agricultural purposes supported by the government. It is a dummy where CREDIT=1 if the household receives this credit and =0 otherwise. It is hypothesized to have a positive impact on food security because credit can help to expand production and income generating activities (Beyene and Muche 2010).

RESULTS

Table 3 reports the results of the logit analysis. The model appears to perform well correctly predicting the food security status of nearly 75% of households which is relatively high (Peng and So 2002). McFadden's pseudo-R^2 is also highly satisfactory (McFadden 1979); and the likelihood ratio (LR) is significant indicating that there is no relationship between the log of odds of household food security and the set of independent variables. Thus, the model with all predictors fits significantly (Fox 1997). Estimates of the probability of food security are explained in terms of odds ratio (OR). Factors that have a significant relationship with the probability of food security are household size, the dependency ratio, the education of the household's head, average household income, total expenditure, food expenditure, revenue from rice sales, household production for own consumption, farm size, fertilizer use, and the number of family workers.

TABLE 3 LOGIT MODEL RESULTS

Variable	Coefficient (SE)	OR
Constant	0.2030 (0.64)	-
HSIZE	-0.6145*** (0.16)	0.539732
GEND	0.0979 (0.11)	1.093305
AGE	-0.0056 (0.01)	0.994622
DR	-2.362*** (0.62)	0.094262
EDU		
- Primary	0.8328*** (0.24)	2.298495
- Secondary	0.9456*** (0.29)	2.574385
- Degree	2.233*** (0.59)	9.327808
INCOME	0.00002*** (0.00)	1.000024
HEXP	-0.00001*** (0.00)	0.999986
FOODEXP	0.00059*** (0.00)	1.000587
SALE	-0.00003*** (0.00)	0.999977
HCONS	0.00020*** (0.00)	1.000200
LIVE	0.2611** (0.12)	1.298733
LAND	0.0461** (0.02)	1.044352
FERT	0.0016* (0.00)	1.001601
LABOR	0.3921*** (0.08)	1.480797
UHC	1.198 (0.23)	1.217606
CREDIT	0.0708 (0.11)	1.073351
Number of observations	2,781	
McFadden's pseudo-R^2	0.23	
Probability (LR-statistic)	0.00	
Overall case correctly predicted (%)	74.47	
Model Wald-statistic (χ^2_{18})	475.30	

*Note: *, **, *** denote significance at 10%, 5% and 1%.*

An increase in household size leads to a decline in the probability of food security. The OR in favor of food security declines by a factor of 0.53, indicating that the probability of food security increases by 47% (that is, 100×[1-OR]) as household size increases by one member. This magnitude is similar to that of Sidhu et al. (2008) who find that a one member increase in households leads to an increase in food security by 44% in India. The result is also similar to the finding of Bashir et al. (2012) in which the OR in favor of food security declines by a factor of 0.58 for households in Pakistan but is larger than Aidoo et al.'s (2013) estimate of 0.25 in Ghana. These differences may be due to social and geographical differences between the countries. The dependency ratio has a significant and negative effect on the likelihood of household food security with the OR of 0.09. This implies that a 1% rise in the dependency ratio lowers the probability of household food security by 92% which is greater than the findings of Maharjan and Joshi (2011) who report 60%, and this may be due to the differences in socio-graphical conditions. Bumrungkit (2014) estimates that rural households in Thailand are more likely to be food-insecure by 34% as the dependency ratio increases by 1%. This result is smaller than our result because of the differences of sample and analytical techniques.

The household head's education has a significant and positive effect on the probability of food security. Households whose head is educated to degree level have a higher probability of being food-secure by over nine times those of non-graduates; the corresponding OR for secondary education or below is 2.57; and that for primary education or below is 2.30. Haile et al. (2005) in Ethiopia, Amaza et al. (2006) in Nigeria, and Bashir et al. (2012) in Pakistan also report that an improvement in education leads to a higher probability of food security. Bashir et al. (2012) find that secondary education or education to degree level of a household head leads to increases in the probability of food security by 1.99 and 2.77 times respectively. The effects of education here are higher than earlier studies because of social and geographical differences.

Household income has a positive effect on food security with the OR of 1.000024. The effects of income on food security here is relatively small because rice-farming households can produce food for their own consumption. Our result is similar to the estimates of Bashir et al. (2012) in Pakistan and Asmelash (2014) in Ethiopia which are 1.0001 and 1.001 respectively. Conversely, total household expenditure which is spent on food and non-food items has a negative impact on food security with the OR of 0.999986, indicating that a 1000 Baht (US$28) increase in household expenditure leads to a decrease in the probability of household food security of 1.4% [$e^{((1-0.999986)x1000)}$ =1.014]. By contrast, expenditure on food has a positive and significant effect on food security with the OR of 1.00059, implying that a 1000 Baht increase in food expenditure leads to an increase in the probability of food security of around 60%.

An increase in revenue from rice sales leads to a decrease in the probability of food security with the OR of 0.99998, indicating that a 1000 Baht increase in the value of revenue from rice sales lowers the probability of household food security by 2%. An increase in the value of production for own consumption leads to a rise in food security with the OR of 1.0002, indicating that a 1000 Baht increase in the value of production for household consumption increases the probability of household food security by 18%. Babatunde et al. (2011) report that the quantity of food produced for own consumption has a positive impact on the probability of food security in Nigeria, but they do not calculate

the OR. Bumrungkit (2014) also finds that household vulnerability to food insecurity decreases as the value of home-produced food increases for rural households in Thailand. Livestock ownership is positively associated to the probability of food security, and the OR indicates that households that own livestock are 7% more likely of being food-secure. Haile et al. (2005) report that livestock ownership increases the probability of household food security by 5% in Ethiopia, while Bashir et al. (2012) find that livestock ownership enhances the food security by 6% in Pakistan.

Turning to factors of production, the number of family workers, farm size, and fertilizer use are positively associated with the probability of household food security. First, the addition of one family worker raises the probability of food security by 48%. This is lower than Zakari et al.'s (2014) estimate of 85% in Niger. Second, the probability of a household being food-secure increases by 4% following a 1 Rai (0.16 hectare) increase in farm size. This is similar to Haile et al.'s (2005) finding that the probability of household food security increases by approximately 6% for a one hectare increase in farm size in Ethiopia. Both however are much smaller than that of Aidoo et al. (2013) (148%) in Ghana. Third, if fertilizer expenditure increases by 1000 Baht, the probability of a household being food-secure rises by 4.95 times. Beyene and Muche (2010) and Asmelash (2014) report that the probability of household food security increases by 5.93 and 1.99 times as households increase the use of fertilizer by 1% respectively.

CONCLUSIONS AND POLICY RECOMMENDATIONS

Rice-farming households have low-incomes and they can be either food-secure or food-insecure. Food security is a binary variable and a logit model is estimated. Findings show that increases in household income, the education of household heads, food expenditure, livestock ownership, own-consumption production, farm size, fertilizer use, and the employment of family workers improve food security. Conversely, increases in household size, the dependency ratio, and total household expenditure lead to food insecurity. Household size and the dependency ratio have negative impacts on food security and these have implications for policies that could address family planning and child day-care services. However, the price of childcare is high and the Thai government could subsidise childcare. The government could also run educational campaigns about the advantages of such services and attempt to change household's perceptions about them. The government should encourage farmers to participate in higher levels of education since the education of household heads has a positive effect on food security. The Ministry of Education (MOE, 2009) introduced a 15-year policy in 2009 covering free education between pre-elementary and upper secondary (aged 3-18 years), and this should help farm households to improve their food security.

Household income has a positive impact on food security, while their total expenditure has a negative effect. The government could introduce a program of information or training to promote the effective management of farm household budgets to enhance nutritious food consumption since food expenditure is positively associated with food security. Production for own consumption is positively related to food security, but rice sales have a negative impact. This suggests that households should prioritise production for own consumption rather than for sale. The government should provide more information on self-sufficiency, and household food production should be aimed first at

sufficiency for own consumption; any excess can then be sold (Mongsawad 2010). An increase in farm size improves food security. Thus, the government should explore the feasibility of promoting land consolidation since land fragmentation often follows the division of land holdings across family members. This process can lead to diseconomies of scale contributing to problems of land protection, loss of working hours, and increasing fixed and variable costs (Demetriou 2014).

Linked to farm size, family labor and livestock ownership also have positive effects on food security and the government should encourage rice farmers to use livestock. Farmers could also be offered training in the concept of integrated farming (or "Rai Na Suan Pasom") where landowners divide their land proportionally into farming, water supply, livestock and living zones. Fertilizer use also has a positive effect on food security but its relatively high price constrains its use. This suggests the introduction of a fertilizer subsidy policy to increase productivity and reduce farm production costs. Our measure of food security focuses on food availability and accessibility due to data availability. Further studies should attempt to capture all dimensions of food security, namely, availability, accessibility, utilization, and stability. Information on health and nutrition status should be collected in the dataset, and longitudinal data should be used to examine the effects of determinants on food security that change over time. In addition, this study only examines food security at the household level and intra-household data are needed to determine how individual and household characteristics influence the distribution of food within the household.

ENDNOTE

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